

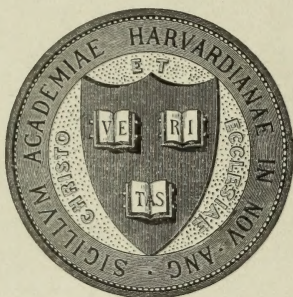
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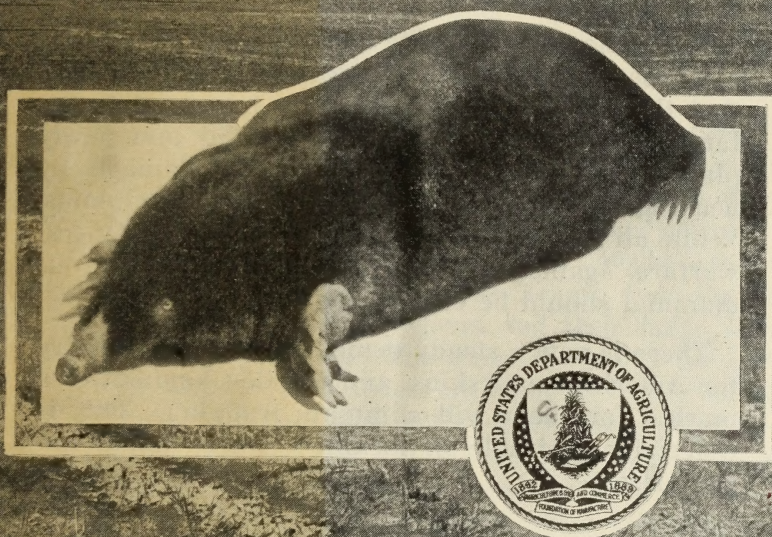
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FARMERS' BULLETIN 12-47
UNITED STATES DEPARTMENT OF AGRICULTURE

59,141

AMERICAN MOLES

AS AGRICULTURAL
PESTS AND AS FUR
PRODUCERS



MOLES have been dealt with in the United States chiefly as a nuisance, but in some European countries they are trapped extensively not only to be rid of them as a pest but also to harvest their pelts. Millions of European moleskins have been used by fur manufacturers in this country and until recently have furnished the sole supply. The fact that the skins of some American moles, especially those found in western Washington and Oregon, are larger and have better texture than those from Europe has been recognized, and there is now a demand for American moleskins by some important American fur dealers. The pelt of the common mole of the Eastern States, though smaller, is about the same quality as that of the European species, and if collected in sufficient numbers to create a demand might be marketed at a slight profit. The propagation of moles for their fur, however, is impracticable.

All species of moles live chiefly upon earthworms and insects that inhabit the ground. To the extent that they destroy insects they are beneficial to the farmer; but they often work in lawns and newly planted gardens, doing considerable damage by heaving up the soil and undermining tender plants. While all are undesirable in such places, no general warfare against an unobjectionable insectivorous mammal should be encouraged.

There is now a steady demand in the fur industry for American moleskins, and the development of a market for them will stimulate trapping. This is especially desirable in localities where moles are troublesome.

Contribution from the Bureau of Biological Survey

E. W. NELSON, Chief

Washington, D. C.

Issued March, 1922

AMERICAN MOLES AS AGRICULTURAL PESTS AND AS FUR PRODUCERS.

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WHERE MOLES ARE FOUND.



WITHIN the boundaries of the United States there are recognized five groups of true moles. Two of these are confined to the Pacific coast and three are distributed over the section mostly east of the one hundredth meridian, extending from Canada to the Gulf of Mexico (see map, fig. 1). No moles are known from the Great Basin and the Rocky Mountain regions, and their range is very restricted on the Great Plains. The common mole of the eastern United States¹ may be found almost anywhere south of New England, New York, Michigan, and central Minnesota, except in the mountain regions. In the latter districts and in the greater part of Pennsylvania, New York, New England, and to the northward, the common mole is replaced by the star-nosed mole² and the Brewer mole.³ The Townsend mole⁴ of the Pacific Coast States is the largest of its kind on the continent and is more abundant locally than

¹ *Scalopus aquaticus.*

² *Condylura cristata.*

³ *Parascalops breweri.*

⁴ *Scapanus townsendii.*

NOTE.—This bulletin treats of moles occurring throughout the United States and supersedes Farmers' Bulletin 583, which deals with the habits of eastern species, and Farmers' Bulletin 832, which treats chiefly of trapping western forms for their fur.

any species of mole occurring elsewhere. The Gibbs mole,⁵ another west-coast form, is so rare as ordinarily to escape notice.

The general distribution of the mole seems to depend very largely upon atmospheric humidity and the resulting condition of the soil. Moles are absent altogether from our arid regions, and where the prairies of the Middle West merge gradually into the Plains the animals are found only along water courses. In these regions of deficient rainfall the ground is so dry and hard the greater part of the year as to be wholly unsuited to the existence of earthworms and the various insect larvae upon which the mole depends for subsistence. In the East the mole is most abundant in moist, rich soils along streams, particularly if these situations are somewhat shaded. In the

cooler, more uniform climate of the Northwest coast region moles are plentiful anywhere in the well-watered valleys.

DESCRIPTION.

So seldom is the mole seen, even by those who are familiar with its work, that it is often confused with other small creatures, particularly the shrew, the vole (or meadow mouse), and the pocket gopher. The cheek pouches of

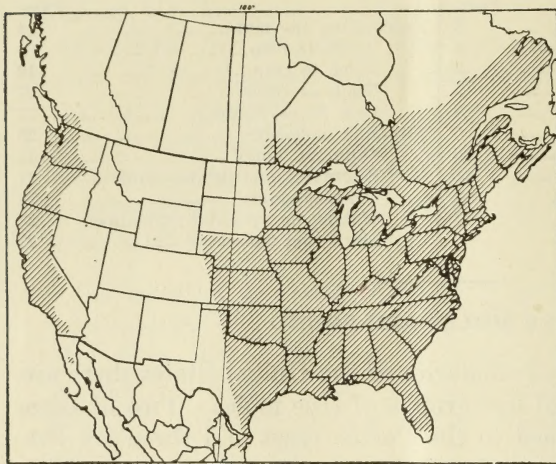


FIG. 1.—Distribution of moles in North America. The Pacific coast area includes the ranges of the Townsend and Gibbs moles (*Scapanus* and *Neurotrichus*); in the eastern area are the common mole (*Scalopus*), the star-nosed mole (*Condylura*), and the Brewer mole (*Parascalops*).

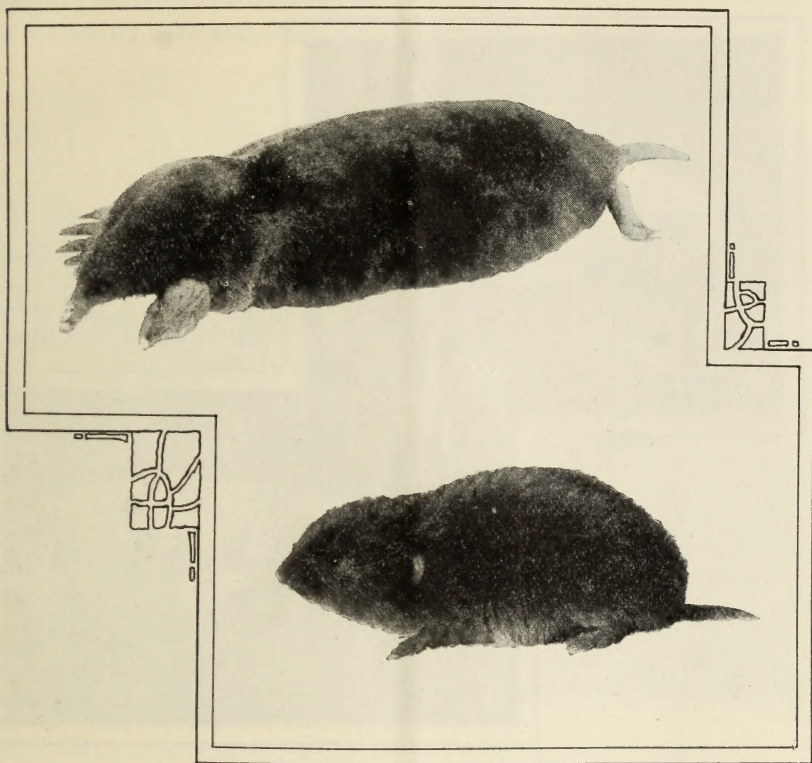
the pocket gopher readily distinguish it from the sightless mole. The mole is not a rodent, and can be readily distinguished from any of these and from the shrew by its short, stout front limbs, ending in broad, rounded hands with palms turned outward; it has a rather elongated body, close plushlike fur, a pointed snout, and a short tail (figs. 2 and 3). Neither external eyes nor ears are ordinarily in evidence. If not totally blind, the common mole of the eastern United States can at best merely distinguish between light and darkness, as what remains of its organs of sight lies wholly beneath the skin. Degeneration of these organs has ap-

⁵ *Neurotrichus gibbsii*.

parently not proceeded so far in the Townsend mole, which usually opens its eyes when annoyed by an observer.

HABITS.

The mole lives mostly underground. Such experiences as fall to its lot must necessarily come through its sensitive touch, acute hearing, or highly developed powers of smell. While the animal is



B671M; B670M.

FIG. 2.—Comparison of mole and a member of the rodent order (pine mouse). Broad, rounded hands turned outward, pointed snout, and practical absence of eyes serve to distinguish the mole from mice, rats, and other rodents.

seldom seen above ground, it sometimes ventures out of its tunnels, perhaps chiefly at night, since skulls and other remains of moles are occasionally found about the nesting places of owls.

RUNWAYS AND NESTS.

When a mole is living in lawns, gardens, or fields, it is not adept at concealing the evidences of its presence. Telltale ridges (see title-page illustration) or conspicuous mounds (fig. 4) of earth

plainly indicate the runways. The ridges show the direction and course of the animal's hunting paths, which are so close to the surface that the sod or the soil crust is raised. The mounds indicate deeper tunneling, for they are formed of earth pushed up from lower workings, where the soil is too compact to be simply crowded aside. Such mounds thickly dot the mole-infested areas of the Pacific coast country, but are of much rarer occurrence in the habitat of the eastern species.

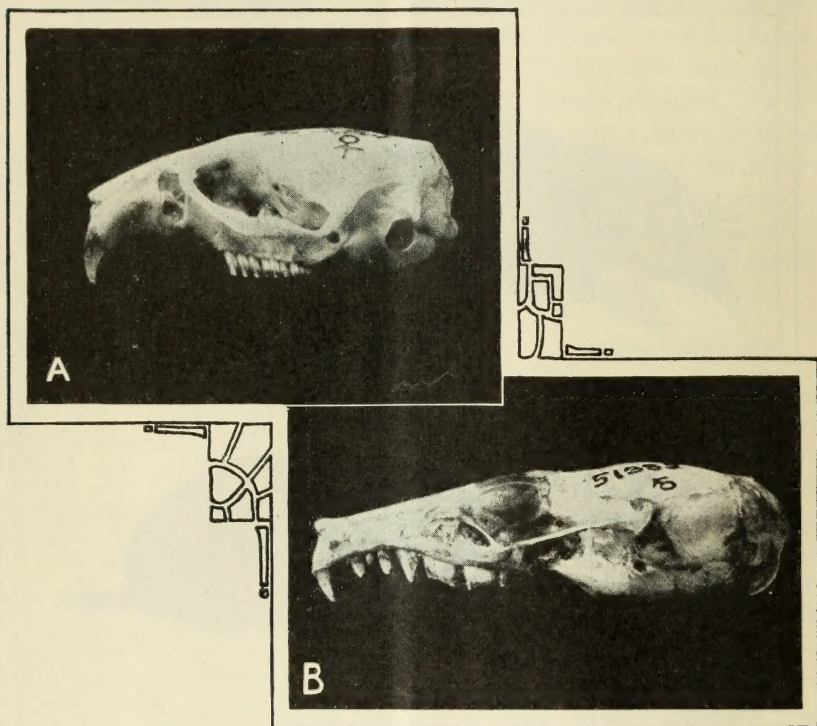


FIG. 3.—Difference in shape of head and arrangement of teeth in moles and in rodents is readily observed in these typical skulls. (A) Skull of field mouse (*Microtus*, N. M. 30424) ; (B) skull of mole (*Scalopus*, N. M. 51385). Both are enlarged to twice natural size.

The mounds of the Townsend and other moles of the west coast resemble superficially the earth heaps thrown up by pocket gophers, but usually they can be distinguished from the latter by even casual inspection (fig. 5). The mole heaps are the more rounded and symmetrical and are built up, volcano fashion, by successive upheavals beneath and through the center of the pile, the soil, in compact little masses, rolling down the sides from the summit. The pocket gopher, on the other hand, brings up the soil excavated in its workings and dumps it on the surface in armfuls, thus forming

low, semicircular, or fan-shaped accumulations of fine dirt more or less to one side of the burrow exit.

The more permanent tunnels of the mole commonly run along fences, hedges, walks, plant rows, and the ridges of open fields. Such situations are the more frequented by the mole because they offer some concealment or shelter and are less often disturbed by the activities of man. These burrows vary in depth from 2 or 3 inches to levels beneath the reach of the plow. They constitute a labyrinth of runways, constructed with apparently no definite plan and including here and there an enlargement. One or more of these



B67411

FIG. 4.—Mounds characteristic of moles in the Pacific coast region (see also fig. 6).

These thickly dot the areas infested by the Townsend mole in Washington and Oregon. They are not usually found in areas frequented by eastern moles.

enlargements may, especially in the breeding season, contain a nest of half-dried grass or of grass and dead leaves.

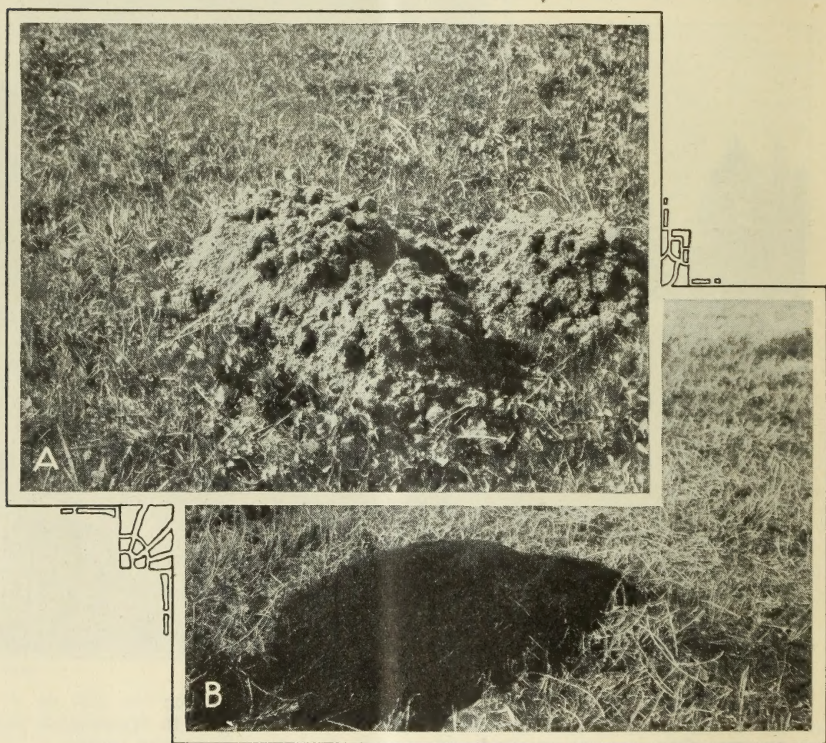
Certain galleries or passages leading out from the deeper central system trend upward here and there to join the shallow subsurface runs that stretch out over the mole's hunting grounds (fig. 6). Through these runs, the little animal hurries along at irregular intervals in search of food and, when occasion demands, extends the limits of its operations by pushing out into untouched soil.

As it extends the subsurface runways the movement of the mole is almost literally one of swimming. With powerful action of the

heavy shoulder muscles the hands are brought forward, palms outward, until they almost or quite touch in front of the snout. They are then thrust outward and backward to push the soil aside, while the body follows in the passageway thus created. The snout is a sensitive organ of touch and is not used for rooting.

ACTIVE PERIODS.

It is commonly believed that the mole works only at regular periods each day—morning, noon, and evening, as most frequently alleged—



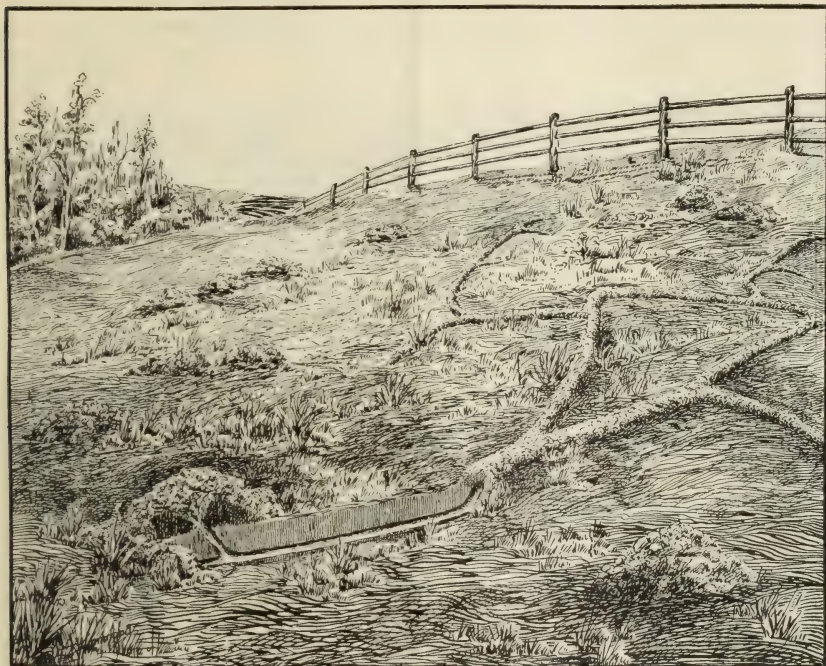
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FIG. 5.—(A) Mound of western mole contrasted with (B) mound made by pocket gopher. The former is the more symmetrical, being built up volcano fashion by upheavals through the center. The latter is fan shaped, thrown out to one side of the burrow exit.

but direct observations fail to show that there is any one time of day when it is more active than at others. If an opening is made into a mole's runway the little animal will invariably repair the breach when it next comes that way (fig. 7). By taking advantage of this habit one can gain much information if he will visit, at short intervals through the day, each of a number of runs in which a small break has been made. In an experimental way a large number of

runs have thus been kept under observation for periods of several days at a time, with results indicating that moles are as likely to be found working at one hour of the day or night as at another. This is especially true at seasons when there is no great variation in temperature throughout the period of 24 hours.

As to seasonal activity, it may be said that moles are probably never dormant, that they never hibernate. They may be trapped at any time of year when the ground is not frozen too hard to permit



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FIG. 6.—Mounds and ridges of earth similar to those shown in figures 4 and 5. A sectional view of part of a deeper runway connected with mound and with subsurface hunting path is shown. Traps give best results when on these main tunnels.

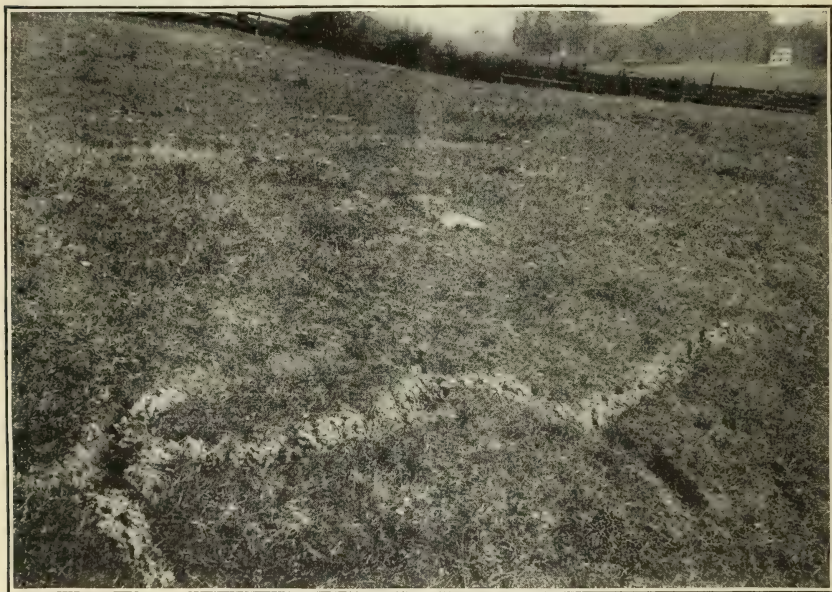
the working of the trap. It must be understood, however, that extension of surface runways occurs mainly at times when soil conditions are favorable—after rains in summer or during periods of thaw in winter. At other times in its search for food the mole must use its old runs or work at depths and in situations unaffected by frost or drought. Movements of soil-inhabiting worms, insects, and larvae tend to bring ever fresh supplies of food into these tunnels.

BREEDING HABITS.

Contrary to popular opinion, moles are slow breeders. Their life of seclusion shelters them from many of the dangers that constantly threaten the existence of the small mammals living above ground.

To maintain their normal numbers from generation to generation a rapid rate of increase, therefore, is not necessary. The young are brought forth early in spring in rudely constructed nests of half-green grass stubble and rootlets. The number in a litter is commonly three in the case of the Townsend mole and four with the common eastern mole (fig. 8).

Moles grow and develop with astonishing rapidity. In the Puget Sound country most of the young are born in the latter half of March and spend the month of April in the nests. By the last of May they are so well grown that the ordinary observer would not be likely to distinguish them from the parent moles. This rapid



B14316.

FIG. 7.—The mole's method of repairing runways. Lower right-hand fork not repaired.

growth accounts for the fact that a really small young mole is seldom, if ever, trapped. By the time they leave the home nest and take to the runways for themselves they have already attained something like the proportions of adults.

NATURAL FOOD.

A mole's appetite seems to be almost insatiable. When held in captivity and given food to its liking, it will sometimes eat more than its own weight in a day. The large quantity of food thus required is no doubt due to the intensely active life the little animal leads. Perhaps no other mammal is relatively so strong or does so much hard work in a day.

The character of the food has been the subject of much discussion, but the multiplied evidence of digestive tract, dentition, stomach content, and choice of food when in captivity leaves no doubt that the mole is a carnivorous animal, though vegetable matter is sometimes found in its stomach. An examination of 200 stomachs of the common eastern mole, taken in all months of the year, demonstrated that earthworms and white grubs constitute the bulk of the food. Beetles and their larvae and other insects that enter the ground, spiders, centipedes, cocoons, and puparia also form a portion. In one stomach were found the remains of 171 small white grubs, in one 250 ant puparia, in one 10 cutworms, and in another 12 earthworms. The last-named item forms the great bulk of the food of the moles



B18643.

FIG. 8.—Young of the Townsend mole in nest removed from underground chamber. The eastern mole averages about four to the litter. The number in the litter of the Townsend mole is commonly three, as here pictured.

of the Northwest coast country, for the soil there fairly teems with earthworms, while ground-inhabiting insects and larvae are comparatively scarce. The presence of more or less starchy material in the stomachs of some moles is proof that the little animal occasionally varies its worm and insect diet with some vegetable food. Seed coats of peas, corn, wheat, oats, and peanuts have been identified in a few stomachs. In captivity moles ravenously eat beefsteak, flesh of birds, fish, or almost any sort of fresh meat, but starve to death when supplied with nothing other than grain and root crops.

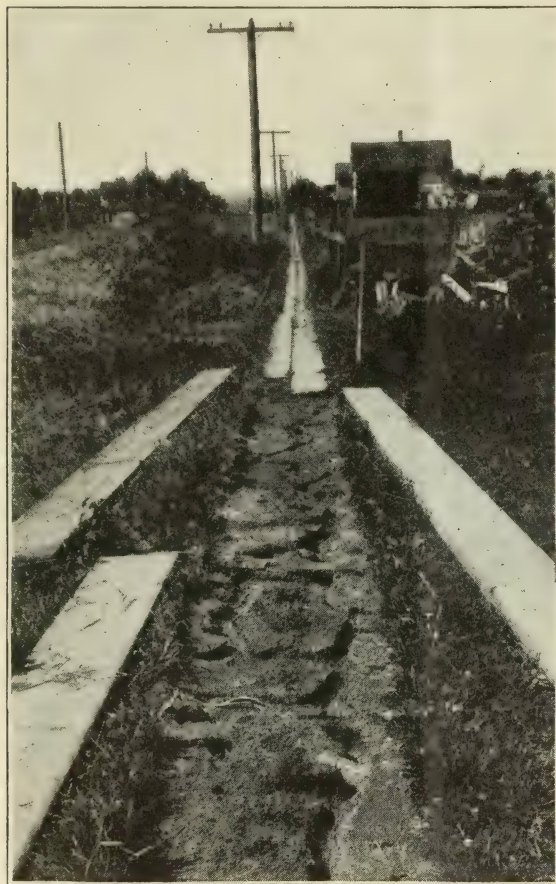
DAMAGE BY MOLES.

From the standpoint of food habits it would seem that moles are chiefly beneficial to our interests, or at least neutral. It is probably

true, though, that the large Townsend moles of the Pacific coast have acquired the habit of foraging in gardens to a greater extent than the common moles of the Eastern States. The proofs that they destroy sprouting corn and peas and newly forming bulbs and root crops are direct and final. The gnawing and hollowing out of mature bulbs and tubers, however, is not the work of moles but of the

rodents that trespass in their runways. The mole is not a rodent and is badly handicapped for gnawing by its projecting snout, which extends nearly a half inch ahead of the small incisor teeth.

It is common knowledge that in certain situations moles become an intolerable nuisance from their habit of upridging the sod, throwing up mounds, tearing up the roots of plants, displacing bulbs, and creating general havoc in gardens, lawns, and parks. In meadows and grain fields, too, the mounds are objectionable, not only by reason of the growing crops they cover, but also because of the ob-



B18630.

FIG. 9.—Mole runways under sidewalk. From such shelter and nesting places moles run riot in adjacent gardens, lawns, and parks.

struction they offer to the use of machines in mowing or harvesting. The presence of moles in some of these situations may be evidence of heavy infestation of the soil by white grubs or other insect larvae, but the case in point is only another illustration of the old saying that the remedy may be worse than the disease.

In the valleys of the Northwest coast region moles infest farm premises and towns much as rats do similar situations there and

elsewhere in the country. They find shelter and dry places for nesting under sidewalks (fig. 9), sheds, poultry houses, porches, and even dwellings. From these harbors they run riot over the premises.

NATURAL ENEMIES AND CHECKS.

On account of its secluded life the mole is little subject to attacks by the many foes of other small mammals. Its burrow is so small that no formidable enemy except perhaps the weasel or the snake can follow it underground, and as it seldom leaves its passageways there is little chance of its being seen by predatory animals. However, the movement of the soil when a mole is working near the surface may readily be detected by a watchful foe, and it is probable that hungry denizens of the wild secure a morsel of food now and then by springing suddenly upon a disturbed spot of earth and hurriedly digging out the furry little miner. But there is good evidence that moles are distasteful to some animals at least, if not to all, for they are seldom eaten by the domestic cats and dogs that have learned to catch them. The peculiar rank odor of a mole may account for its not being relished. It is quite likely, also, that the dense, soft fur is objectionable to some animals.

Among birds of prey, the hawks and owls take only a small toll from the mole tribe. An examination of the stomach contents of over 2,000 of these birds disclosed the remains of only 13 moles.⁶ Five of these had been eaten by the red-tailed hawk, 4 by the red-shouldered hawk, and 1 each by the broad-winged hawk, the barred owl, the great gray owl, and the screech owl. Of 3,005 skulls of small mammals found in pellets disgorged by the barn owl, only 2 were of the mole.

Occasional or periodic floods which spread over lowlands adjoining streams constitute one of the greatest checks to the inordinate increase of moles. During these inundations large numbers of moles may be found congregating on elevated knolls and ridges or clinging to drift masses lodged against various obstructions. Even though these individuals survive, their young have probably perished, for it is in the breeding season that the freshets commonly occur. It has been noted, too, that heavy rains at this season drown some of the young in the nests.

TRESPASSERS IN MOLE RUNWAYS.

The mole is not permitted to enjoy undisputed occupancy of the underground galleries which its industry has constructed. Certain other small mammals, particularly shrews, voles, or meadow mice,

⁶ Fisher, A. K., *Hawks and owls of the United States in their relation to agriculture*; Bull. 3, Div. Ornithology and Mammalogy, U. S. Dept. Agr., 1893.

and sometimes ordinary house mice, rats, and pocket gophers, find these tunnels convenient highways for traffic and marauding. As a result of this trespassing the reputation of the mole suffers, for most of the injury to seed grains, tubers, and roots of cultivated plants is directly chargeable to these intruding rodents. A study of tooth marks on the damaged products or the systematic trapping of the intruders will bear out this statement. In the East, Middle West, or Far West, wherever a count is made of the occupants of mole runs, the trespassers are usually found to be much more numerous than the moles themselves.

CONTROLLING THE MOLE.

Experience in dealing with the mole problem over many years shows that it is impracticable to poison these little animals or to combat them successfully in any way except by the use of the trap. The very nature of their food makes it difficult to secure an acceptable substitute for the living grubs, worms, and insects upon which they feed. Then, too, they seem shrewd and quick to sense the danger in poisoned substances.

They may be driven from certain parts of their burrows by introducing substances that are ill smelling or in other respects offensive or injurious to them; but this is only temporizing with the evil and not getting rid of it. One may occasionally drown out a mole by the use of a garden hose, but in this there is the risk of leaving parts of the lawn or garden boggy. Gases introduced into the runways by specially designed pumps, by the evaporation of liquids on wads of absorbent material, or by the burning of "cartridges," do not always reach that part of the burrow where a mole is located and whence it is unable to escape. Such gases are usually dissipated in the loose soil at points where the runways are near the surface.

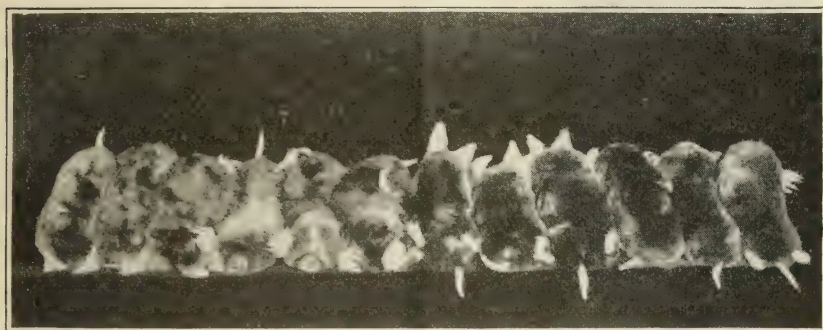
WHERE TO TRAP.

As stated in the discussion of runways and nests, the signs of a mole's presence and activity are not hard to discover; the earth ridges and mounds are only too conspicuous. The path on which the trap must be set is thus located. For the moles east of the Rockies dependence must usually be placed on trapping in the hunting paths marked by the ridges. Trapping on the Pacific coast is attended with better success when the deeper runways indicated by the mounds are selected for the scene of operations.

Many of the deeper runs of the mole are highways of common traffic, used often by a number of individuals, and frequented also, as previously stated, by shrews and certain species of small rodents. Good catches usually may be expected from continued use of traps

in these highways, particularly when they run along fence lines or ridges in the open fields, or cross from sod into cultivated ground. In such situations a dozen to twenty or more moles are not infrequently taken in the course of a few weeks by resetting the trap day after day at the same spot (fig. 10). While moles are not considered colonial in their habits, an individual will follow any runway that opens up to him, regardless of whether it or another mole has dug the passage. It is therefore sometimes possible to rid the entire premises of moles by trapping at one spot, and thus to avoid disfiguring lawns and garden beds in the operation.

It will pay to set traps on ridges over temporary hunting paths only when these have been constructed recently in damp soil, or have



618645.

FIG. 10.—One morning's catch of Townsend moles, near Puyallup, Wash. The broad hands and pointed snouts of these little fur bearers distinguish them from members of the rat and mouse tribe.

not become so dry that the mole would no longer find profit in using them in search of food. Since the ridges usually have many turns and windings, it is well to set the traps on a part of the path that takes a straight course for some distance or seems to be a connecting road between two sets of workings. The same plan should be followed with a line of mounds. Clusters of mounds are associated with numerous cross runs, thus lessening the chances of successful trapping.

It is seldom worth while to set traps in a dry place. The mole generally works in a moist, rich soil, for there the digging is easy, and there its food abounds. Then, too, a satisfactory adjustment of the working parts of a trap can not be made in dry dirt. The more recent the signs of mole activity at any particular spot, the sooner a catch may be expected. It will pay to visit all traps twice a day, morning and evening. In the summer season they should be visited also in the middle of the day, for the hair on a mole pelt soon becomes

loose in even moderately warm weather, and, as described farther on, the value of the pelts is such as to make trapping worth while.

WHEN TO TRAP.

Moles may be trapped successfully in the Pacific coast country at any season of the year, and elsewhere when weather conditions permit. In the Eastern States trapping will be more or less hindered in winter by snows and severe freezing. Moles are active all winter, however, and frequently have been caught along grass-grown fence rows and even in the deeper runways of open fields when the ground was frozen so hard as to necessitate the use of a pick in setting traps.

If trapping is undertaken chiefly with a view to gathering a harvest of fur, the best time of year for the operations is when the skins are prime. The fur of the mole is perhaps at its best in the winter season, but it is also classed as prime in midsummer, though it is somewhat shorter then. Less seasonal variation is found in the pelage condition of this burrowing mammal than in that of the fur-bearing animals that live mainly above ground. Nevertheless, during the molting periods in spring and in fall there is a deterioration in the value of the mole's fur (fig. 11). The spring pelage change is less marked than the fall and is more irregular in its occurrence, the time of molting varying with the individual, with sex, and with



B579M.

FIG. 11.—Example of unprime pelt of the eastern mole, trapped near Fort Myer, Va., in the month of April. (The shape of the feet shown in the picture indicates the difference between moles and mice.)

weather conditions. In a collection of more than 600 skins of the Townsend mole, taken in western Washington in all weeks of the year, the percentages of prime skins for the several months ran as shown in Table I.

TABLE I.—Percentages of prime skins of moles taken in different months.

Month.	Prime skins.	Month.	Prime skins.	Month.	Prime skins.
	<i>Per cent.</i>		<i>Per cent.</i>		<i>Per cent.</i>
January.....	100	May.....	80	September.....	65
February.....	75	June.....	90	October.....	10
March.....	75	July.....	80	November.....	15
April.....	50	August.....	95	December.....	95

The basis of classification in determining these percentages was the appearance of the leather side of the dried pelt—clear tan color for the prime skins and spotted or blotched with bluish black for those not prime. Moleskins are mainly thus graded by fur buyers, although, of course, the value depends also on the size of the pelt and the care with which it has been handled. Some skins are wholly bluish black underneath and all unprime skins are more or less thickened in the cutaneous tissue. Moleskins are considered marketable, no matter at what season of the year they are taken, but clear, prime pelts command the better prices.

KINDS OF TRAPS.

In Europe a great many moles are taken by means of homemade snaring devices. The trappers there also make use of both wooden and metal traps that are cheap and of simple construction, but none of those that have been tried out give satisfaction in this country. All types of mole traps in common use in America are made of metal and depend for their operation on the same sort of tripping device—a trigger pan designed to rest on an obstruction produced in the mole's runway when the trap is set.



FIG. 12.—A good strong garden trowel is the best tool to use in setting mole traps.

The trap is sprung when the mole follows its natural instinct to reopen the run by burrowing through or upheaving the obstruction. This may be confidently counted upon, for the mole has no more persistent habit than that of reopening and repairing its runways when they have been obstructed by accident or design. All efficient mole traps have been constructed with this habit in mind. The entire mechanism of such traps is above ground or concealed in the loose soil, no part being within the runway proper. It is useless to try to catch moles with any sort of device exposed in the runway, for the mole almost invariably burrows under anything placed in its path.

The catching and killing mechanisms of American mole traps are of three types: (1) choker loops, (2) gripping or scissor jaws, and (3) impaling spikes. Several different makes of the impaling or harpoon trap are on sale, particularly in the East and Middle West; in actual use, however, they are the least efficient of the three and have the additional disadvantage of injuring the skins of moles that are trapped for their fur. The other two types are illustrated in figures 13 and 14.

HOW TO SET TRAPS.

An excellent tool for use in setting mole traps is a good, strong garden trowel, such as is illustrated in figure 12. A spade or shovel

may also be used, but one should take care to make the break or opening into the burrow no larger than is necessary to accommodate the trap; otherwise the mole may turn aside from the original course and pass through without being caught. Even when placing the trap on one of the shallow hunting paths it will pay, unless the soil is fairly loose and mellow, to dig into the runway and adapt the setting to known conditions, rather than to set from the surface by simply forcing the jaws or the loops into the soil. Sometimes, in

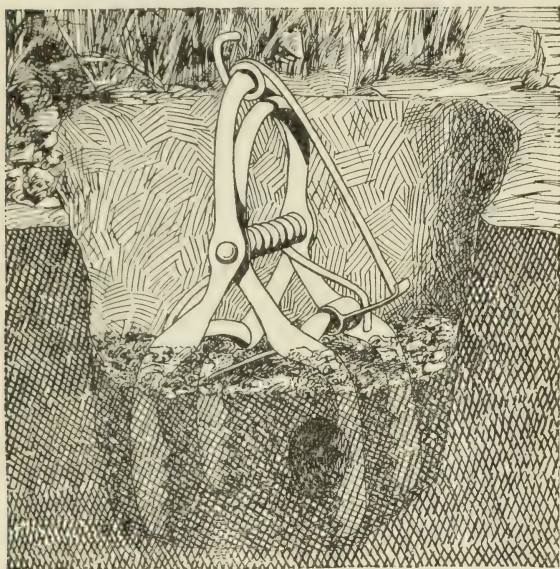


FIG. 13.—Scissor-jaw, or gripping-jaw, trap. Phantom view, showing its position in relation to a deeper runway of the mole. The soil must be loosened with trowel and freed from obstructions, as sticks, stones, or clods, in order that the trap may act quickly. The jaws must straddle the course of the runway.

by the surface ridge. To find a deeper runway from which a mound of earth has been pushed out, clear away the mound and feel or prod for the short passageway running obliquely down to the main tunnel. Follow its course, usually only a few inches, and place the trap on the main run.

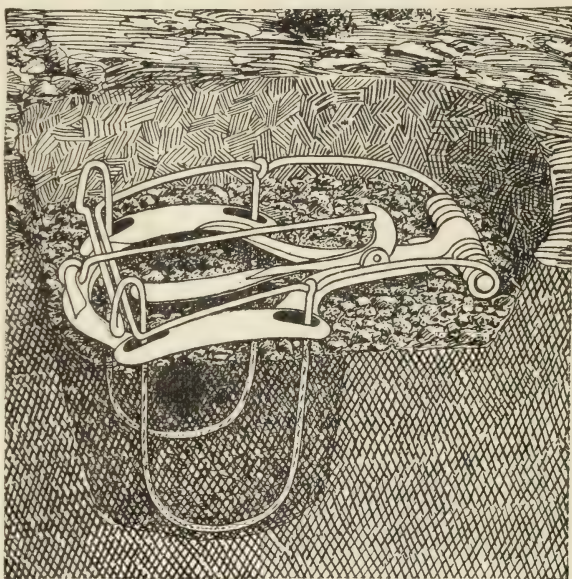
Scissor-jaw traps.—To get the best results with the scissor-jaw type of mole trap (fig. 13) the soil in which the setting is made should first be loosened with a trowel and freed from sticks, clods, or pebbles, as the jaws must close through the soil to make the catch and will, of course, act the more quickly the less they are obstructed. In a deep setting make the excavation for the trap a little lower than the level of the bottom of the runway, for the tendency of a mole is to pass under rather than to one side of a

digging, three or four forks of the burrow may be discovered, in which case there is nothing to do but fill the break and try elsewhere; a mole trap will face but two ways. No importance need be attached to the admonition one sometimes receives to use gloves in setting mole traps to prevent the animals' getting the scent of human hands; long experience has shown this precaution does not affect the catch in any way.

The location of one of the shallow hunting paths of the mole is plainly indicated

break or obstruction encountered in its burrow. Then fill in enough loose damp earth to hide and block the passageway and settle the trap into place, its jaws straddling the course. This course may be determined by feeling for the tunnel openings with a small stick. The trigger pan should rest snugly on the soil, but the dirt should not be packed elsewhere under the trap, lest the mole upset or spring it before getting well within the jaws. Outside the base of the trap the soil may be pressed down, if need be, to hold things more firmly in place.

Choker-loop traps.—In setting the choker-loop trap (fig. 14) less attention need be given the matter of getting the soil fine and loose. The loops may be firmly forced into the ground with the certainty that they will react promptly when the trap is sprung. Traps of this type will also stand up to the work better than any of the others when used in heavy clay or gravelly soils. When placed in position on a mole runway the loops should encircle the course of the run and reach a little deeper than the level of the bottom of it. Before placing the trap on a deep setting fill in enough



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FIG. 14.—Choker-loop trap. Phantom view, showing trap placed in position on one of the deeper runways of a mole's system of burrows. The loops must encircle the runway.

earth to come up against the frame. A convenient way of getting the trap into position is to hold the end of the trigger wire down with the left thumb, the fingers grasping the spring arm. Then with the free right hand compress the damp soil beneath the trigger pan, or place a little piece of sod under it, so that the two will be in snug contact when the setting is completed. As in the case of the scissor-jaw type, the soil should be loose under the trap except immediately beneath the trigger. This precaution applies particularly to the use of these traps for the large moles of western Washington and Oregon. Both traps were originally devised for the smaller moles east of the Rockies.

UTILIZING MOLESKINS.

The solution of the problem of getting rid of the mole as a pest has been found in the value of the pelts to the fur trade. Until recently the little animal had been captured more with the aim of exterminating a nuisance than of utilizing its skin. In this way a by-product of trapping has long gone to waste, when an industry might have been developed that would have resulted in the production of beautiful and valuable garments or articles of apparel. It is significant of our lack of attention to small business matters that American moleskins were not sooner quoted or offered on the markets. Moleskin garments have been fashionable in this country, particularly in the large eastern cities, for many years, and fur dealers consider it probable that undressed mole pelts will continue indefinitely to have a marketable value, this value fluctuating, of course, with the demands of fashion and the visible supply.

In England, Scotland, and some of the Continental coast countries, moles are trapped extensively both for their pelts and for the private bounties paid for their extermination on certain estates. Up to about the year 1917, when the Biological Survey was prosecuting its investigations in the matter, the sole source of supply of moleskins for use by manufacturing furriers of this country was the pelts of the European mole,⁷ obtained through importations from London. In periods when moleskin garments were in fashion, or when the skins were to be obtained at all, the volume of American business in furs of this class sometimes reached between \$2,000,000 and \$3,000,000 annually.

The Biological Survey has found that the skins of the common mole of the eastern United States are well within the class of the imported product, while pelts of certain other American moles are of much greater value for the furrier's purposes than those of the European species. They should, therefore, be classed by themselves. This applies particularly to the skins of the common large mole of western Washington and Oregon, which are larger and have better texture and fur than those of Europe. Since these facts have been recognized by a number of the more important fur dealers, a demand for American moleskins at prices remunerative to the trapper has developed. Figures obtained from the trade indicate that about \$50,000 worth of American moleskins were marketed in 1918, and that in 1919 the business increased by nearly 25 per cent. This does not take into account the value of moleskins utilized in the home. Furthermore, values of the manufactured products—moleskin garments, fur sets, and fur trimmings—will approximate at least five times that of the raw peltry.

⁷ *Talpa europaea*.

SKINNING MOLES.

The process of skinning a mole is very simple, and with a little practice one should be able to do the job in five minutes, including the stretching of the pelt to dry. The skin envelopes the animal very loosely, showing considerable slack wherever handled. It is so tough, too, particularly in the larger species, that it will stand all the pulling necessary to remove it from any part of the body. Perhaps the best tool for the work is a small, strong pair of scissors about 4 or 5 inches long, with one blunt-pointed and one sharp-pointed blade (fig. 15). A pocket knife with a sharp-pointed blade may be substituted for the scissors.

Proceed as follows: With scissors or knife make a slit in the skin down the middle of the belly from chin to root of tail, loosening the pelt with the fingers as you proceed, to avoid cutting through into the abdominal cavity. Now husk the skin from the body, using the cutting tool only to sever the legs at the ankles, the tail at the root, and the arms at the wrists—all on the inside. After a little snipping at the connective tissue about the neck and head, the skin can be pulled over the nose and off the body entirely.



FIG. 15.—Scissors with one blunt and one sharp point, suitable for use in skinning moles. These should be strong, as the bones of arms and legs must be cut with them.

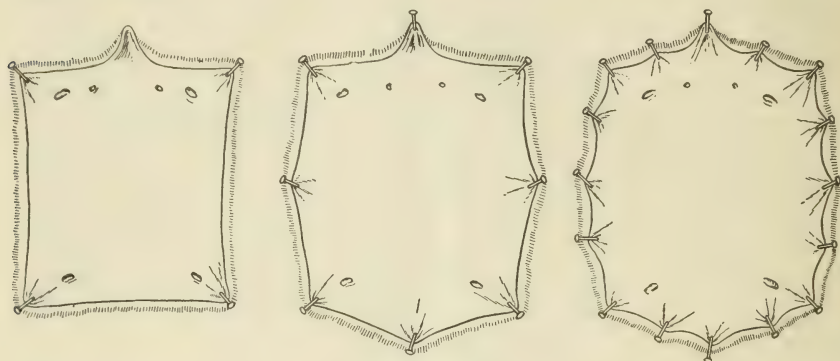
STRETCHING AND DRYING PELTS.

When the skin is off, pick from it any bits of fat that may have adhered and snip off the dangling legs and tail in such way as not to cut the pelt proper. Now stretch the skin on a board to dry, fur side down, using common pins for the purpose. They are strong enough, sharp, and do not leave holes in the pelt as tacks or nails would. A light tack-hammer will serve to drive the pins, and a pair of forceps with corrugated tips will help in the stretching, though after a little experience one will care to use the fingers only.

Hang the drying boards where the air circulates freely, but not in the sunshine. In damp or rainy weather it is best to dry the skins indoors, placing them as far as practicable from any stove or other source of heat. They will dry in a few days and, when stiff and parchmentlike, may be stored away indefinitely, though it is not best to hold them more than a few months to a year, as they become brittle with age when not tanned. They need no treatment with preservatives of any sort, but must be kept in a cool, dry place safe from insects and mice.

The European moleskins are stretched on drying boards in rectangular form, four pins only being used. Some fur dealers in this

country also recommend the four-square shape. However, in this shape they do not dry so well at the edges, are more subject to insect infestation in the folds, and do not show to such good advantage when marketed as when they have been pinned out in the shape shown in the accompanying illustration (fig. 16). It seems worth while, also, to standardize the method of handling American moleskins in this way, so that they may be distinguished readily from the imported skins.



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FIG. 16.—Drying skins on a board, showing the three stages of work on one skin: (1) Four pins are first used, one in each corner; (2) four intermediate pins are then inserted, the skin being slightly stretched; (3) finally, eight more pins are tacked in, one between each two of those already in place. A light tack-hammer will serve for driving the pins.

TANNING SKINS.

If it is desired to make up the skins at home for trimmings or fur pieces the following method of tanning will be found very satisfactory:

For a tanning liquor add to each gallon of water 1 quart of salt and one-half ounce of sulphuric acid. This mixture should not be kept in a metal container. Moleskins need not remain in the liquor more than one day, although no harm will be done if they are kept there longer.

When removed from this liquor the skins are washed several times in soapy water, wrung as dry as possible, and rubbed on the flesh side with a cake of hard soap. They are then folded in the middle over a line, hair side out, and left to dry. When both surfaces are barely dry and the interior is still moist they are laid over a smooth, rounded board and scraped on the flesh side with the edge of a worn, flat file or a similar blunt-edged tool. In this way an inner layer is removed and the skins become nearly white in color. They are then stretched, rubbed, and twisted until quite dry. Fresh butter or other animal fat worked into the skins while warm and then worked out again in dry hardwood sawdust, or extracted by a hasty bath in gasoline, increases their softness.

MAKING UP FURS AND TRIMMINGS.

In trimming or cutting the skins one should use a sharp knife or razor blade instead of scissors to avoid shearing the fur at the edges. When matching skins in a piece the best appearance is produced by arranging them so that the fur of no two adjacent skins strokes in the same direction. This produces a checkerboard effect that is pleasing.

The great bulk of the moleskins supplied to the manufacturing furriers in this country are dressed and dyed ("blended" or "tipped") by special processes involving the use of machinery. Most of this work is done in a few establishments in New York and Brooklyn. The leather side of the pelt is commonly dyed to prevent its light color from showing at the seams in a garment or where the fur may chance to part. This process, it is claimed, does not affect the color of the fur itself, which may be subjected to another bath in a dye to secure a uniform shade in all skins.

Not all the best grades of skins are dyed, and, when they all come from the same general locality, very pretty fur pieces may be made up at home or by a local furrier without any blending, provided one has skins enough from which to make a satisfactory selection. Fifteen to twenty skins of the common mole of the Northwest coast are sufficient to make an average-sized scarf for ladies' wear. Twenty skins will make a muff of average size and 30 skins a large one. About double these numbers of skins of eastern moles will be required for the same purposes. If muff foundations are not to be had locally they can usually be obtained through mail-order establishments.

Moleskin is imitated in the trade by shearing the fur of some animal having longer pelage, usually "cony" or other rabbit, cutting it into rectangular pieces, and dyeing it the proper taupe shade.

MARKETING MOLESKINS.

As a rule the farmer boy or the trapper who has accumulated a lot of moleskins will want to dispose of them as he would any other kind of pelt, by selling to a reliable fur dealer. Commonly the smaller local furriers do not handle this class of skin and are not posted on current prices or methods of grading. In this case it would be well to write for lists or quotations to one of the larger establishments doing business by mail. The plan of pooling shipments of moleskins through farm-bureau organizations has been successfully tried out in some communities. Inquiries in matters of this sort addressed to the Bureau of Biological Survey, Washington, D. C., will receive prompt attention.



